

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

A Method of Imparting Durable Creases to Garments

We, DOW CORNING CORPORATION, of Midland, Michigan, United States of America, a corporation organised under the laws of the State of Michigan, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method of imparting durable creases and crease resistance to garments containing thermoplastic fibres.

It is known that so-called permanent creases (i.e., creases which are resistant to laundering or dry cleaning) can be imparted to cotton fabric by impregnating the fabric with an aqueous solution of an urea- or melamine-formaldehyde resin, drying the fabric, forming it into a garment and then pressing the garment to form creases in the desired locations.

The pressing is carried out under conditions of heat and pressure which cause the formaldehyde resin to cure while the garment is held in the creased position, thereby fixing the crease in such a way that it is not obliterated by washing or normal wear.

It is also known that silicones can be used in conjunction with these formaldehyde resins in order to soften the finished fabric, thereby imparting a better hand. The silicone is used as a coating on the fabric which has been impregnated with the permanent crease forming resin.

It has unexpectedly been found according to the invention the silicones alone will impart a durable crease to certain types of fabrics, as shown below.

It is an object of this invention to provide permanent creases in garments by a method which obviates the use of heretofore employed permanent crease-forming resins so that one

obtains a permanent crease, an excellent hand and water-repellency in one operation and with only one treatment.

This invention provides a process of imparting permanent creases to a garment which comprises:

(1) applying to a fabric comprising fibres formed from a thermoplastic organic polymer a curable organosiloxane in an amount of at least 0.5% by weight calculated on the weight of the fabric,

(2) forming the fabric into a garment, and

(3) arranging those areas of the garment in which it is desired to form creases in creases and subjecting the garment to sufficient heat and pressure whilst so arranged so as to set the thermoplastic fibres and cure the siloxane to a flexible resin, said siloxane being the only permanent crease-forming resin applied to the fabric.

The term "permanent crease-forming resin" as employed herein means a resinous composition which is applied to the fabric for the purpose of imparting a permanent crease to the fabric.

For the purposes of this invention the fabric can be made from any thermoplastic organic fibre. As is well-known, these fibres are generally melt-spun and include, for example, fibres made of synthetic plastics, such as polyesters, such as polyesters including long chain synthetic polymers composed of an ester of terephthalic acid and ethylene glycol; polyamides such as long chain synthetic polyamides having recurring amide groups as an integral part of the polymer chain, e.g. nylon polyacrylonitrile fibres; co-polymers of vinyl chloride and vinylidene chloride; polyvinylidenenitrile; polyethylene; polypropylene; copolymers of any of the above; ethyl cellulose and cellulose acetate. The term "fabric comprising fibres formed from a

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thermoplastic organic polymer" also includes blends of those thermoplastic fibres with natural fibres such as cotton, wool, silk and linen, in which the thermoplastic fibre makes up a major portion (i.e. at least 35% and preferably at least 50%) of the fibres in the fabric.

The silicones applicable to this invention are any of those which cure to flexible materials. As is well-known these, in general, comprise the di-substituted organopolysiloxanes in which the substituents are essentially all hydrocarbon radicals or halogenated hydrocarbon radicals such as aliphatic hydrocarbon radicals such as ethyl, methyl, propyl, octadecyl, vinyl, allyl and hexenyl; cycloaliphatic hydrocarbon radicals such as cyclohexyl, cyclopentyl, cyclohexenyl and methylcyclopentyl; aromatic hydrocarbon radicals such as phenyl, xenyl, tolyl, and naphthyl, and aralkyl hydrocarbon radicals such as benzyl, β -phenylethyl and β -phenylpropyl. The substituents can also be any halogenated hydrocarbon radical such as chloromethyl, gammachloropropyl, chlorophenyl, bromophenyl, chloroxenyl, bromocyclohexyl, α,α,α -trifluorotolyl and radicals of the general formula RCH_2CH_2- , in which R is a perfluoroalkyl radical such as trifluoromethyl, pentafluoroethyl and C_7F_{15} .

The siloxane can be cured on the fabric with any of the conventional curing techniques employed by siloxanes. For example, the siloxanes can be cured with peroxide catalysts or any of the standard catalysts normally employed with siloxane materials. Often it is desirable to employ siloxane cross-linking materials which aid in the cure of the siloxane and these include methyl hydrogen siloxane, alkyl silicates such as ethylsilicate; acyloxy silanes such as methyltriacetoxysilane and oxime silanes such as $C_2H_5Si[ON=C(CH_3)_2]_2$.

After the siloxane has been applied to the fabric and the fabric formed into a garment, those areas of the garment in which it is desired to form creases are arranged in creases and the garment subjected to heat and pressure. The amount of heat needed should be sufficient to set the thermoplastic fibre and to cure the siloxane resin. In general, this can be accomplished at the temperature of 150° to 205°C., although these values are not critical and will vary, depending on the nature of the thermoplastic fibres or the proportion of the thermoplastic fibre in the fabric and on the nature of the siloxane. The amount of pressure need be only that sufficient to form a satisfactory crease, and in general, 700 to 1050 g./sq cm. is sufficient.

The garment can be held in the press for a sufficient time to cure the siloxane completely. However, this is a rather slow process and it is generally desirable for economic reasons to hold the garment in the press for

sufficient time to form the crease and partially to cure the siloxane, thereby setting the crease and then to place the garment in a heated environment, such as an oven, in order to complete the cure of the siloxane. This enables a faster operation of the press.

With most siloxanes a press-cure of 15 seconds at 150° to 205°C. and 700 to 1050 g./sq cm. of pressure and a post-cure of some 4 to 15 minutes at 150° to 205°C. is sufficient. It should be understood, of course, that these values are not critical.

If desired, other materials can be incorporated in the siloxane resin in order to perform specific functions not related to crease resistance. For example, small amounts of anchoring agents such as vinylacetoxysilanes can be included in order to increase the adhesion of the siloxane to the fabric. In addition one can incorporate other materials in small amounts to reduce undesirable odours which may arise, or one can incorporate sun screen agents or other materials for incidental reasons not related to the crease phenomenon.

The siloxane can be applied to the fabric in any desirable manner such as from a solution or an emulsion by dipping, spraying or padding. It is necessary to apply at least 0.5% by weight of siloxane solids to the fabric in order to obtain the desired crease performance. The upper limit of siloxane is not critical. For economic reasons one would not normally employ more than 5% by weight.

The following Examples illustrate the invention. All percents are by weight.

EXAMPLE 1

A fabric composed by 65% of a polyester fibre comprising a co-polymer of terephthalic acid and ethylene glycol and 35% of cotton was padded with a solution having the following composition

4.3% of a polydimethylsiloxane gum containing 3% by weight of methyl hydrogen polysiloxane,
0.16% of dibutyl tin dilaurate
0.5% of vinyltriacetoxysilane
0.16% of additional methyl hydrogen polysiloxane
0.05% of a trimethyl-end-blocked polydimethyl siloxane of 60,000cs. viscosity at 25°C.,
25°C.,
0.1% of ethylpolysilicate
0.2% of an urea-formaldehyde odour reducing agent
0.1% of acetic acid and
94.43% of perchloroethylene.

The fabric was dried to remove the solvent and the silicone pickup was 1.5% by weight.

The fabric was sewn into trousers, and the trousers were pressed for 15 seconds at 171°C. at a pressure of 700 to 1050 g./sq.cm. steam in order to form a crease in the

desired position. The trousers were then removed from the press and heated for 10 to 15 minutes at 163°C.

- 5 The resulting garment was washed five times at 60°C. in a conventional household washer employing a commercial detergent. The trousers retained their crease and the fabric had an excellent hand.

EXAMPLE 2

- 10 A fabric as defined in Example 1 was padded with the following composition:
1.56% of a mixture of 35.9 parts by weight of a dimethyl-polysiloxane gum, 23.2 parts by weight of a hydroxylated dimethylpoly-
15 siloxane liquid and 1.8 parts by weight of methyl polysiloxane,
0.3% of dibutyl tin dilaurate
0.5% of vinyltriacetoxysilane
0.1% of acetic acid
20 0.5% of tetrabutyltitanate
the remainder being perchloroethylene.

The silicone pick-up was 1.3 per cent by weight.

- 25 The fabric was dried and allowed to stand for 20 days at the end of which time it was sewn in to trousers and was pressed under the conditions shown in Example 1, and thereafter removed from the press and heated for 10 minutes at 163°C. The fabric showed
30 excellent crease retention after five washings at 60°C. with a commercial laundry detergent in a household washing machine with tumble drying.

EXAMPLE 3

- 35 The fabric of Example 2 was padded with the following composition:
3% of a mixture of 97% of a dimethylpoly-
siloxane gum and
3% of methyl hydrogen polysiloxane
40 0.5% by weight of dibutyl tin di-2-ethylhexoate
0.5% of vinyltriacetoxysilane
0.1% of acetic acid
0.5% of tetrabutyltitanate
45 the remainder being aliphatic hydrocarbon solvent.

The silicone pick-up was 1.6 per cent by weight.

- 50 The fabric was dried, sewn into trousers and pressed as shown in Example 2 and then heated for 10 minutes at 163°C. The fabric showed excellent crease retention after five washings as shown above.

EXAMPLE 4

- 55 The fabric of Example 2 was padded with an emulsion containing:
1.29% of a dimethylpolysiloxane liquid having a viscosity of 100,000 cs. at 25°C.
0.44% of methyl hydrogen polysiloxane

0.26% of a mixture of dibutyl tin diacetate and zinc octoate, the remainder being water. 60

The silicone pick-up was 1.5 per cent by weight.

The fabric was dried, sewn into trousers and pressed as shown in Example 2, and then heated for 10 minutes at 163°C. The fabric showed excellent crease retention after being washed five times as shown in Example 2. 65

EXAMPLE 5

70 Excellent crease retention was obtained when fabrics made from the following types of fibres were substituted in the procedure of Example 2; co-polymers of vinyl chloride and vinylidene chloride, polyethylene, polypropylene, cellulose acetate and polyacrylonitrile. 75

In each case the silicone pick-up was 1.5 per cent by weight.

EXAMPLE 6

Improved crease retention was obtained 80 when the following siloxane gums were substituted for the dimethylpolysiloxane gum of Example 2:

1. a co-polymer of dimethylsiloxane and phenylmethylsiloxane 85
 2. a co-polymer of dimethylsiloxane and diphenylsiloxane
 3. polyethylmethylsiloxane
 4. polymethylvinyl siloxane
 5. a co-polymer of dimethylsiloxane and octadecylmethylsiloxane 90
 6. a co-polymer of dimethylsiloxane and chlorophenyl-methyl-siloxane.
 7. a co-polymer of β -phenylpropyl(methyl)-siloxane and dimethylsiloxane and 95
 8. poly (3,3,3-trifluoropropyl)methylsiloxane.
- In each case the silicone pick-up was 1.5 per cent by weight.

WHAT WE CLAIM IS:—

1. A process for imparting durable creases 100 to a garment which comprises
 - (1) applying to a fabric comprising fibres formed from a thermoplastic organic polymer a curable organosiloxane in an amount of at least 0.5% by weight calculated on 105 the weight of the fabric,
 - (2) forming the fabric into a garment, and
 - (3) arranging those areas of the garment in which it is desired to form creases in creases and subjecting the garment to 110 sufficient heat and pressure whilst so arranged so as to set the thermoplastic fibres and cure the siloxane to a flexible resin, said siloxane being the only permanent crease-forming resin (as hereinbefore defined) applied to the fabric. 115
2. A process as claimed in claim 1 in which the siloxane is a dimethylsiloxane.

3. A process as claimed in claim 1 substantially as described with reference to any of the Examples.

4. A garment prepared by the process
5 claimed in any of the preceding claims.

ELKINGTON AND FIFE,
Chartered Patent Agents,
High Holborn House,
52/54 High Holborn,
London, W.C.1,
Agents for the Applicants.

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